

NNE. from Hesketh Park, there is a free exposure. The vane is 62 feet above the ground, which is flat and open. There is no tree or other obstruction within $\frac{1}{4}$ mile (except some very low buildings to the SE.); while from WSW. through N. to E. is absolutely open.

The records for the instruments at this station, two Dines anemometers and a Baxendell anemoscope with twin recording cylinders, show far less gustiness than those from Hesketh Park.

The differences between the directions of the wind at the two stations are sometimes very striking. They mostly occur with fairly light winds from easterly points. There was a striking example on the night of October 1 and 2, 1917. The speed of the wind at Marshside at 23h. 30m. was 3.5 m/s and the veer from N., 124° . Up to midnight, the wind freshened and reached 5.4 m/s, then it fell off again to 2.7 m/s at 0h. 35m. During the whole of this time it was veering slowly, the direction being given by 138° at midnight and 146° at 0h. 35m.

On the other hand, at Hesketh Park, during the same period, the wind was too light for measurable speed to be given by the anemobiograph. The direction from 23h. 30m. to midnight was about 150° from N., i. e., not far different from that at Marshside, but at midnight there was a sudden shift to 70° . Agreement was not restored for half an hour.

It will be seen that the wind at Hesketh Park during this half hour had no apparent relation to the general flow of air, such as would be shown on a weather map. It may be noted that the temperature of the air at 16h. at Hesketh Park had been 29.4 A. At 23h. 30m. it was 28.4 A. so that there was probably a well-marked inversion in the upper air. As the wind at Marshside strengthened, there was a fall of the Hesketh Park temperature to 28.3 A. at midnight, and this was followed by a corresponding rise as the wind dropped. The direction differences are, however, by no means always associated with temperature peculiarities, and often occur with somewhat higher wind speeds than in the foregoing instance, and last longer

ON THE VELOCITY OF THE WIND IN THE STRATOSPHERE.

By J. ROUCH.

[Abstract of note in *Comptes Rendus*, Paris, 1919, vol. 169, pp. 1281-1283.]

In view of the generally accepted statement to the effect that winds of the stratosphere are light, the following note may be of interest. The mean wind velocity during 78 pilot-balloon ascensions which reached 10 km. altitude from coastal stations in France is as follows, for each kilometer from 0 to 10: 3.3, 5.1, 5.1, 5.0, 6.0, 6.4, 7.3, 7.9, 8.5, 9.5, 11.8. Thirty-six of these reached or exceeded 11 km. and 7 went above 15 km. If we may assume that the stratosphere was from 11 km. up, the winds in the stratosphere were stronger than those at 10 km. two times out of three. This is the case with clear weather and moderate winds below. What the conditions are when the sky is cloudy, or when the winds of the troposphere carry the balloon out of sight before it can reach the stratosphere, is unknown.—C.F.B.

THE DRIFT OF METEOR TRAILS.

[Abstracted from *Nature*, London, May 23, 1918, p. 232.]

Observations made upon the enduring trails of meteors have given some clue as to the speeds of the upper winds as well as the directions. The data as a whole are not

of sufficiently accurate a character to enable definite conclusions to be drawn; nevertheless, there can be little doubt as to the general correctness of the results. The streaks of the Perseids and Leonids, which are usually seen at an altitude of 55 or 60 miles, have yielded an average movement eastward of 121 miles per hour. The individual speeds varied from nil to 360 miles per hour. Certain streaks gave evidence of a series of differing currents underlying each other, the upper sections drifting in different directions from the lower.

NOTE.—In reference to the above article in *Nature*, Dr. C. J. P. Cave has replied that the trails of meteors remain luminous too long to be due to heating of the air by the passage of the body. He suggests that the trail is a result of the ionization of the air by the passage of the meteor and the subsequent flow of electricity through this ionized air. He questions the reasonableness of such rapid movements in the stratosphere.—C. L. M.

THE PREVAILING WINDS OF THE UNITED STATES.

By ROBERT DEC. WARD.

[Abstracted from *Annals of the Association of American Geographers*, vol. 6, 1916, pp. 99-119.]

One of the chief factors to be considered in discussing economic climatology is the wind. As a vehicle for the transportation of moisture and temperature, it wipes out the climatic boundaries, determines rainfall and the distribution of life. Nor is the speed less important than the direction, for upon it depend both physical comfort and many of the practical activities of life. As a source of power the winds are coming more and more to be appreciated in their full significance.

The greater part of our country lies in the belt of the prevailing westerlies, although the southern States share also in the trade winds. These winds find their great initial cause in the differences of temperature and pressure between the Equator and the Poles; but they are modified greatly by local effects introduced by the North American continent, such as seasonal changes of temperature and pressure, mountains and lowlands, and the Great Lakes. The general configuration of the country, the trend of mountains and valleys, locations to windward or leeward of mountains or lakes, the hour of day or night, land and sea breezes, all these have a part in controlling the direction and velocity of the wind at a station. Indeed, so strongly marked are some of these local effects that it is difficult to believe that the prevailing winds are westerly.

It is desirable, however, in studying the broad climatic effects, to eliminate as far as possible these local influences. With this in view, the winds of January and July are discussed. (See figs. 1 and 2.) "From midwinter to midsummer, taking place gradually, as winter merges into spring and spring later merges into summer, there is a great swing of the winds over the eastern United States, from the prevailing northerly and northwesterly to a prevailing southwesterly or southerly direction in July." The warmest winds of the summer are those along the Atlantic seaboard. Sunstroke weather, cholera infantum epidemics, and suffering in the crowded cities are the result; sea bathing, electric fans, thin clothing, and cooling beverages are also closely applied to these warm winds. They are of economic importance in their relation to the spread of the brown-tail moth north and east from Massachusetts, and of the cotton boll weevil north from Texas.